

TECHNOLOGY, TRADE STRUCTURE AND ECONOMIC INTEGRATION

An examination of Intra-Nordic, Nordic-EC and Intra-EC trade 1961-1987¹

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Abstract

This paper discusses the impact of economic integration on production and trade in high-tech goods. The theoretical evidence is considered in section 2. The remaining part of the paper presents an empirical analysis of this relationship for two groups of countries, the Nordic countries and the EC, between 1961 and 1987. A positive impact of integration on trade in high-tech goods may be found for the Nordic countries in 1960s and early 1970s. There is no evidence of a similar relationship for the EC. This supports the view that countries with small differences in culture and language are more likely than others to experience a positive impact of integration on trade and production in high-tech goods.

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1. Introduction

The impact of increased economic integration on production and trade in high-tech industries has received increasing attention lately. Indeed, one of the major arguments behind the establishment of the EC internal market was the assumed positive consequences for EC production and trade in high-tech goods (Commission of the European Communities, 1988, p.129). However, if reduced barriers to trade are especially important for trade in high-tech, they should also show up in a changing trade structure during earlier periods of increased economic integration in Europe. This paper presents and discusses historical evidence on this for two groups of countries: the Nordic countries and the EC.

2. Integration and high-tech

High-tech is a commonly used catch-word for industries that use a relatively large share of their resources on R&D and develop many new products and processes.² To explain why high-tech is important, we need to focus on the links between innovation, growth and trade. The classic reference is Schumpeter (1934, 1939, 1943). In his theory of industrial development, innovation is assumed to be the single most important competitive factor. Innovative firms have a temporary monopoly which allows them to charge higher prices than other firms. They will also grow faster, partly because they have the market temporarily for themselves, and partly because their higher innovative ability implies that they are more competitive. For technological as well as economic reasons, Schumpeter expected innovations to cluster in some (R&D-intensive) industries. Production in these industries should also be expected to experience above average growth.³

Thus, high-tech means high growth, and this probably explains the general concern in many countries for the fate of high-tech industries. But why should increased integration, or reduced barriers to trade, be especially conducive to trade in high-tech goods? Assume, for instance, that a group of countries, which we will call a "region", reduces the barriers to trade between them. Following traditional neoclassical trade theory, this should lead to increased

² Sometimes it is argued that one should also include industries that make intensive use of products with a high R&D content, even if they do not spend much on R&D or develop much new technology themselves. Although this broader definition may be interesting for some purposes, in this paper we will stick to the more commonly used, narrow definition. This restricts the concept, high-tech, to industries that innovate.

³ If production grows fast, it is normally reflected in trade statistics. This is easily confirmed by the data used in this study. For instance, the high-tech share of world trade, as defined in this study (see section 3), roughly doubled between 1961 and 1987.

specialization, based on cross-country differences in relative factor endowments, and more (inter-industry) trade between the countries in the region. Hence, production and exports in high-tech industries should be expected to increase for a country with a comparative advantage in, say, R&D. For other countries, imports of high-tech goods should be expected to increase. However, a similar relationship holds for products that use other factors intensively and countries with a comparative advantage in these factors. Thus, as long as the reduction in trade barriers is roughly the same for both high-tech and other products,⁴ this perspective offers no reason to assume that reduced barriers to trade between a group of countries should have an especially strong impact on high-tech trade.⁵

This may be different if some assumptions of the traditional theory are relaxed. The "new trade theory" (Helpman 1984, Krugman 1989) has challenged the assumptions of the traditional theory by introducing imperfect competition, product differentiation and economies of scale. If the relative factor supplies of the countries under study are similar, this theory predicts that trade between them will be of an intra-industry rather than inter-industry type. The expected pattern is one in which each country specializes in a set of differentiated products and trades these with each other. Under these assumptions, reduced trade barriers might be expected to increase trade most intensively for differentiated products produced under economies of scale.⁶ Most trade analysts (see, for instance, Krugman, 1988, p.7) consider this to be the most likely explanation for the increase in Western European trade during the last decades. Lundberg (1990) has produced supportive evidence for this in trade between the Nordic countries and the EC. If the combination of product differentiation and economies of scale is more frequent in high-tech industries than elsewhere, as could perhaps be assumed,⁷ trade in high-tech goods should also be expected to grow faster than total trade (following a reduction in trade barriers).

⁴ Before the formation of the EC and EFTA, tariffs were generally lowest for raw materials and highest for manufactures, with semi-finished products in a middle position (Lundberg, 1976, Herin and Pintado, 1985). Thus, the formation of the EC and EFTA, as well as the later free trade agreements between the EC and EFTA countries, should be expected to increase trade in manufactures faster than total trade. However, manufactures include both "high-tech" and more "traditional" products. Some of the latter, such as for instance clothing, textiles and footwear, had very high initial tariffs.

⁵ Grossman and Helpman (1991) have introduced the principle of comparative advantage in a two-country general equilibrium "new growth model". Essentially, this model suggests the same pattern as the traditional theory, though in value terms: Spill-over effects may cause production and trade in high-tech to grow faster than in other products, but this will be outweighed by changes in the terms of trade.

⁶ One exception, though, is when trade is a result of market segmentation (so-called "reciprocal dumping"), and increased integration leads to the abolishment of the segmented markets. However, this is probably of little empirical importance (Lundberg 1990, Melchior 1990).

⁷ For instance, Lundberg (1992), in an analysis of Swedish-EC trade, found that product differentiation, R&D intensity and market growth tend all to be correlated.

There is another theoretical approach which focuses more directly on trade in advanced manufactures (i.e., high-tech). This approach, pioneered by Burenstam Linder (1961), applies an evolutionary perspective to the internationalization process of the firm (Johanson and Vahlne 1977, Håkansson 1987, Johansson and Mattson 1988, Lundvall 1985, 1988). The main emphasis is on learning; firms learn through communication and interaction with their customers. This learning is reflected in the competence, products (including quality) and competitiveness of the firm, and sets the ground for a further expansion of the customer base, domestically as well as abroad. However, communication and interaction with customers involve (fixed) costs which are assumed to increase with "distance", defined to include differences in culture, language and institutions.⁸ Proximity (in this sense) should be expected to be especially important in high tech industries, where technology is complex and changing, and the need for close interaction between the users and producers of technology is large (Lundvall, 1988). Thus, when high-tech firms enter international markets, they should be expected to start in the markets that appear most "similar" to the domestic market in these respects.

The literature in this area does not discuss the possible impact on internationalization of a reduction in trade barriers between a group of countries. Arguably, this might be expected to speed up the internationalization process, since it lowers the costs of communication and interaction with customers in other countries. To some extent this mirrors the predictions of the "new trade theory", discussed above. What differs is the meaning of "similarity". In the "new trade theory", this refers to (similar) factor proportions, in the evolutionary approach it includes factors such as culture, language and institutions as well.

3. Data and methods

The presentation that follows draws from a database⁹ on OECD trade (value data) for selected years 1961-1987. It is often suggested that it would be preferable to use volume data instead of value data, but this was not possible at a sufficiently disaggregated level. Furthermore, volume data are problematic in cases where substantial technological changes occur and become, for the very same reason, less reliable when the time span under consideration grows. For instance, it is

⁸ Compared to recent literature, Burenstam Linder (1961) was more concerned with differences between countries in income-levels. But he also mentioned cultural and political factors. For instance, he argued that "Similar language and cultural backgrounds could be expected to increase the intensity of trade among the Scandinavian countries ..." (p. 108).

⁹ The database was constructed jointly by Bent Dalum (at the University of Aalborg) and the author from OECD Trade Series C. See Fagerberg (1986) for details.

very difficult to compare the trade volumes of, say, computers in 1961 and 1987, since it is not clear how "volume" in this case should be defined.

The data were aggregated into 5 sectors (Products based on natural resources, Oil and gas, Chemicals, Machinery and Traditional industrial products) and 41 product groups (table 1). Great care was taken to ensure that research- and development-intensive products as well as products based on important, commercially successful innovations in the not too distant past were specified as separate products. More mature products, on the other hand, were treated in a more aggregative way. In table 1, research-and development-intensive products are marked with an asterisk.

(Table 1 here)

The classification of products according to research and development intensity (expenditures on research and development as a share of output or sales) was based on other studies (Kelly 1977, Aho and Rosen 1980, OECD 1985). While the two earlier studies were based solely US data, the last one uses data for a group of OECD countries. However, with a few exceptions, these studies end up with rather similar rankings of products according to R&D intensity. It should be noted, though, that a few products classified as research- and development-intensive in the two earlier studies, did not appear as such in the last study (non-electronic office machinery (typewriters etc.), consumer electronics and cars). Probably, this reflects that these products, by the early 1970s, had entered the mature phase of the product cycle. We have chosen to regard these as R&D intensive prior to 1973, but not later. Thus, we end up with two lists of high-tech products, a broad one, applicable for for the 1960s and early 1970s, and a more narrow one, assumed to be appropriate for the most recent period.

In the following we will examine intra-Nordic trade, intra-EC trade and Nordic-EC trade in the 1961-1973 and 1973-1987 periods. The method of analysis will be comparative, across both product groups and regions (the Nordic countries and the EC). The main focus will be on high-tech goods, but calculations for the sector, as well as the total, level will be reported for comparison.

The indicator of integration that will be used is the familiar *share of intra-regional trade in total regional imports*. For instance, the total imports of a group of countries, say M , may be divided between imports from countries in the region, say M_r , and imports from other countries, say M_w . Then the share of intra-regional trade in total trade, s , is defined as

$$(1) \quad s = M_r/M,$$

The change in this share (named *change* in tables 2-15) is defined as

$$(2) \quad \Delta s = s_t - s_{t-1},$$

Both s and Δs depend on the size of the region.¹⁰ To compare the change in s in a small region, say the Nordic area, to that of a larger one, say the EC, we use the *relative change*, or rate of *growth*, in s , defined as

$$(3) \quad \Delta s/s = (s_t - s_{t-1})/s_{t-1}$$

This rate can be calculated easily from tables 2-15. It tells us whether, and to what extent, the trade *between* countries in a region grows more than the *total foreign trade* of these countries (cf. equation 1).

For convenience, the term market share will refer to the share of a country's exports in the total imports of a group of countries (region).

4. 1961-1973: The period with two competing trade blocks

*The Nordic countries*¹¹

In 1960, GDP per capita in the Nordic countries was on average less than half of that in the USA (Maddison, 1991). There were important differences between the Nordic countries: GDP per capita in Finland was only two thirds of that in Sweden, with Norway and Denmark occupying a middle position.¹² Sweden also had a more advanced manufacturing industry, and a higher share of manufacturing products in exports than the other Nordic countries. Still, all Nordic countries were primarily exporters of natural- resource based products (Fagerberg 1986, 1990). In 1961, the share of products based on natural resources in total exports to the OECD (not including intra-Nordic trade) ranged from 66.0% in Sweden, to 97.6 % in Finland and 99.4% in Iceland, with Norway and Denmark again in a middle position (83.9% and 79.2%, respectively).¹³

Following the formation of the EFTA in 1960, intra-regional trade in the Nordic area increased relative to the total foreign trade of these countries. Between 1961 and 1973, the share of intra-Nordic trade in total imports to the Nordic countries increased from 15.2 % to 23.0 % (table 2), a growth of 51 %. The growth was most marked for traditional industrial products (93%), followed by products based on natural resources (64%). For chemicals and machinery, the share of intra-Nordic trade in total Nordic imports grew somewhat less, by 36% and 24%,

¹⁰ Obviously, for the world as a whole s must equal unity (or 100 %).

¹¹ Denmark, Finland, Iceland, Norway and Sweden.

¹² Maddison does not include Iceland.

¹³ These country specific data are documented in Fagerberg (1986), Vedlegg 2.

respectively. However, intra-regional trade in high-tech products (table 3) grew much faster, by 66 % (broadly defined), i.e., clearly above the average.

(Tables 2-3 here)

Thus, the highest growth in intra-regional trade is found for the least advanced, and the most advanced, products.¹⁴ For the least advanced products, the reason for the large increase in intra-regional trade could be that many of these products were heavily protected by tariffs, which were later eliminated between EFTA countries. In the Nordic area, this was of special importance for Finland, as the economically least advanced country (excluding Iceland). In fact, 41 % of the total increase in intra-Nordic trade in traditional industrial products is accounted for by increased Finnish exports.

However, Finland also increased its share of the Nordic market for some high-tech products. This holds to an even larger extent for the other Nordic countries. For instance, the Norwegian share of total Nordic imports¹⁵ actually tripled between 1961 and 1973 for several high-tech products (telecommunications, consumer electronics and machinery for the production and distribution of electricity). For Sweden, as the most advanced country, the largest increases were recorded for office machinery, telecommunications, consumer electronics and cars. By the early seventies, the Nordic countries' combined share of total Nordic imports had reached 25-40% for many high-tech groups.¹⁶

Nordic-EC trade in this period does not share many characteristics with intra-Nordic trade. While the shares of the Nordic countries in total Nordic imports increased by one half, Nordic shares of EC imports decreased by around one third. This decline was relatively evenly spread over the different sectors (table 4). The Nordic countries' share of EC imports of high-tech products (table 5) declined too.

(Tables 4-5 here)

¹⁴ This finding is consistent with Ferreira (1993) and earlier studies by the EFTA Secretariat. See Ferreira 1993, section 5.1.

¹⁵ These country-specific data are documented in Fagerberg (1986), Vedlegg 2.

¹⁶ One important exception is computers, where Sweden had a relatively high share of both the Nordic market (table 3) and the EC market (table 5) in the early 1960s. These shares, however, were gradually eroded as the electronic revolution made mechanic and electromechanic solutions obsolete and Swedish industry failed to adapt.

The EC

In the early 1960s, GDP per capita was on average at the same level in the EC as in the Nordic area. Italy was the poorest, and the Netherlands the richest, member country (Maddison 1991). GDP per capita in Italy was about two thirds of that in the Netherlands, or roughly the same as that of Finland compared to Sweden. But compared to the Nordic countries, the EC was much less dependent on exports of natural resource-based products.¹⁷ Also, the share of intra-regional trade in total imports was more than twice as high in the EC than in the Nordic area (table 6). The latter is primarily a reflection of the EC's larger weight in the world economy. In 1961, the share of the EC countries in total world exports was roughly five times that of the Nordic countries.¹⁸

The share of intra-EC trade in total EC imports increased rapidly in the 1960s. Between 1961 and 1973 it increased from 35.8% to 49.5%, a growth of 38 % . The rate of growth was highest for products based on natural resources (45%) - this was probably a reflection of the common agricultural policy - followed by chemicals (39%). For machinery, transport equipment and traditional industrial products (where the shares of intra-regional trade in total imports were initially relatively high), the growth in these shares was less marked (18% and 3 %, respectively).

Intra-regional trade in high-tech products also grew slower than total intra-regional trade (table 7). Between 1961 and 1973, the share of intra-regional trade in total imports of high-tech goods (broadly defined) increased from 58.8% to 69.3%, a growth of 18%. This is clearly below the growth of intra-regional trade in the sectors to which these high-tech products belong (chemicals and machinery combined). In fact, for several high-tech products, especially in the electronics sector, the share of intra-EC trade in total EC imports declined markedly.

(Tables 6-7 here)

¹⁷ In 1961, the share of products based on natural resources in total exports was 44 % for all six EC countries together.

¹⁸ One way to account for the difference in "size" between two regions is to normalize the share of intra-regional trade in total regional imports (s) by the share of the region in total world imports (s_w). See Ferreira (1993) for a discussion of how to quantify integration effects. The resulting index, $t = s/s_w$, tells us whether the intensity of trade within a region is higher (lower) than what should be expected from the weight of the region in the world economy. Measured in this way, the Nordic countries were more inclined to trade with each other than the EC countries in 1961 (t was 2.52 in the Nordic area compared to 1.25 in the EC). However, for the world as a whole, this index equals unity by definition. Thus it may be argued that this index has a downward bias for large regions.

5. 1973-1987: The creation of a free trade area in Western Europe

The change of integration regime in Western Europe in the early 1970s resulted in a reduced EFTA, with four Nordic and two non-Nordic countries, and an enlarged EC, with nine members including one Nordic country (Denmark). However, for the Nordic countries, the major change was that free trade agreements were negotiated between the EC and the members of the EFTA. In fact, by the end of the 1970s, Western Europe had become a *de facto* free trade area in manufactures.

The Nordic countries

In the early 1970s, the increase in intra-Nordic trade, as a share of the total trade of these countries came, to a halt. Between 1973 and 1987 intra-Nordic trade as a share of total Nordic imports declined slightly (table 8), from 23% to 22% (a relative change of -5%). The drop is larger when oil is excluded (a relative change of -15%). The least favourable developments were observed for traditional industrial products as well as machinery and transport equipment (a relative change of -29 % and -23 %, respectively). For high-tech industries (table 9), the share of intra-Nordic trade in total Nordic imports fell somewhat less, from 17.8% to 15.2% (a relative change of -10%). The losses were especially large in consumer electronics, telecommunication equipment and cars.

To explain why this change of trend occurred, it may be useful to investigate which countries benefitted from the decline in the Nordic countries' share of their own imports (table 10). The most interesting sectors are the ones that were most strongly affected: traditional industrial products, machinery and transport equipment, and high-tech products.

(Table 8, 9, 10 here)

For traditional industrial products, the Nordic loss is matched by increased market shares for the nine EC countries, the countries of Southern Europe¹⁹ and the NICs. The initial six EC members increased their share of Nordic imports twice as much as the EC of nine. This implies, as should be expected (Hine 1985, Ferreira 1993), that a part of Nordic trade with former EFTA members, especially the UK, did not pass the test of reduced barriers to trade

¹⁹ Greece, Portugal, Spain and Turkey. Greece, which is of little importance numerically, has been an EC member since 1981. Portugal and Spain joined the EC in 1986. This, however, can hardly have influenced the trade data for 1987 to any significant extent.

between the former EFTA and EC member countries. *What is perhaps more surprising is the large increase in market shares for countries that did not take part in this process, i.e., the countries of Southern Europe and the NICs.* Together, these countries accounted for more than half of the Nordic loss. This pattern was even more pronounced for machinery and high-tech products. Here, too, shares of the Nordic countries in Nordic imports declined. But so did shares for the EC and the other EFTA-countries. The gainers were, again, countries from outside the EC-EFTA area: Japan, USA/Canada and the NICs. Thus, changes in the country composition of Nordic imports during this period do not solely appear to be a result of the changing EC-EFTA relationship.

The performance of the Nordic countries in the (enlarged) EC market mirrors, to some extent, their performance in the Nordic one (table 11). In the EC too, the aggregate Nordic share keeps up because of oil, but falls when oil is excluded. Between 1973 and 1987 the Nordic countries' share of EC imports for machinery and transport equipment fell from 5.8% to 4.6% (a relative change of -21%). For traditional industrial products the share fell from 4.9% to 4.0% (a relative change of -18%). However, in contrast to intra-Nordic trade, there is no real decrease in the Nordic countries' share of EC imports of high tech goods (table 12).²⁰ The performance differs widely between products groups, though, with more than a doubling of the Nordic countries' share of EC imports of pharmaceuticals (and increases also for other chemical products) and losses for most types of machinery. The losses were especially large for consumer electronics (where the Nordic share was halved), and for computers.

(Table 11-12 here)

The EC

Intra-regional trade holds up better in the (enlarged) EC than in the Nordic area in this period (table 13); to a large extent this is a reflection of the increased scope for trade caused by the enlargement of the EC in 1972 (Fagerberg 1991).²¹ The common agricultural policy, probably,

²⁰ Ferreira (1993, section 5.2) shows that the impact of the EC enlargement and the FTAs on Nordic exports of high-tech goods (group 3 and 4 in her classification) was positive for all Nordic countries but Denmark. However, according to her calculations, the effects were much larger for Sweden than for Finland and Norway.

²¹ If we normalize the share of intra-EC trade by the share of the EC in world exports (see note 18), it becomes clear that the enlargement in 1972 caused a significant drop in the degree of integration (or trade intensity), so defined. In 1973, the trade intensity index (t) was 1.53 for EC6 and 1.27 for EC9. For the latter group this index increased to 1.36 in 1987, indicating increasing integration. However, the EC countries were still much less inclined to trade with each other than were the original six member countries at the time of the enlargement.

contributed positively to this development. In fact, the share of intra-EC trade in total EC imports of products based on natural resources increased from 45.8% to 54.1% between 1973 and 1987, a growth of 18%.

However, as in the Nordic case, shares of intra-regional trade in total imports of machinery, transport equipment and traditional industrial products fell, although relatively less than in the Nordic area. For machinery and transport equipment the share fell from 67.1% to 58.2 % (a relative change of -13%), for traditional industrial products from 63.7% to 53.3% (a relative change -16%), between 1973 and 1987. For high-tech products (table 14), intra-EC trade as a share of total imports declined for all products but aircraft (probably a reflection of the AIRBUS project). The decline was especially marked in telecommunications and consumer electronics.

Changes in the country composition of EC imports during this period (table 15) share many characteristics with intra-Nordic trade. For traditional industrial products, where the share of the EC countries in their own imports declined most strongly, EC losses were matched by increases for the countries of Southern Europe, the NICs, and the residual "rest of the world" group (mostly developing). For machinery, transport equipment and high-tech goods, Japan and the NICs gained most. Thus, as in the Nordic case, the main gains were for countries outside the EC-EFTA area. These developments can hardly be explained by reduced barriers to trade between former EC and EFTA countries during this period.

(Tables 13, 14, 15 here)

6. Discussion

Section 2 of this paper discussed the possible impacts of reduced barriers to trade between a group of countries on trade in high-tech goods. Following the traditional theory, *intra-regional trade* between these countries should be expected to increase faster than their total trade. However, as long as the reduction in trade barriers is roughly the same for all goods, no specific product pattern should be expected. The "new trade theory", in contrast, predicts: for countries which do not differ too much in (relative) factor endowments, this increase should be especially manifest in differentiated products where large, unexploited economies of scale exist. Many of these can probably be assumed to be high-tech products. The evolutionary approach, it was argued, adds a qualification to this, by pointing out that the increase in intra-regional trade in high-tech goods should be expected to be larger between countries where differences in culture, language and institutions are small.

To what extent are these predictions consistent with the historical evidence? Since the

two time periods considered differ in many respects, we will discuss them separately.

The creation of the EFTA and the EC (1961-1973)

In the 1960s, economic integration in the Nordic area and the EC display many similar characteristics. Following the reduction of trade barriers within, but not between, the EFTA and the EC in the 1960s, intra-regional trade (as a share of total trade) increased in both areas at the expense of other trading partners. This is consistent with the theories discussed in section 2. But intra-regional trade did not increase to the same extent in both areas. The sectoral composition of the trade increase also differed markedly, in contrast to what should be expected following traditional neoclassical trade theory.

In contrast to the EC, the EFTA was a free trade area for *manufacturing products only*. Since EC integration was more encompassing, one should perhaps expect regional integration, measured as the share of intra-regional trade in total regional imports, to increase faster in the EC than in the Nordic area. In fact, trade in agricultural goods was a strong impetus to intra-EC trade in this period, as the figures for intra-EC trade in products based on natural resources show. Still, intra-Nordic trade grew faster than intra-EC trade. This reflects the fact that intra-Nordic trade in manufactures, traditional as well as high-tech, grew much stronger than in the EC.

One of the most striking differences refers to high-tech trade. In the Nordic case, intra-regional trade in high-tech products grew faster than total intra-regional trade. The opposite was the case in the EC.²² How is this finding to be explained? Arguably, it conforms to the prediction of the evolutionary view with its strong emphasis on similarities in culture, language and institutions. The Nordic countries clearly were more homogenous in this respect than the six initial member countries of the EC. However, the reduction in trade barriers between the Nordic countries in this period took place within the EFTA, which also had non-Nordic member countries. If these countries increased their share of Nordic high-tech imports at more or less at the same rate as the Nordic countries, other factors, such as possible unexploited economies of scale for differentiated products, must have been more important.

One possible test of the evolutionary view, compared to alternative theories, would be to calculate the share of the non-Nordic EFTA-members in Nordic imports of high-tech goods, and see whether the growth in this share differed much from that of the Nordic countries. In fact, it

²² The difference in performance between the two country groups may also be illustrated by trade intensity figures (see note 18). For the Nordic countries this figure increased from 3.16 to 4.72, for the EC from 1.54 to 1.86, between 1961 and 1973. Thus the change was larger for the Nordic countries in both absolute and relative terms.

did. Between 1961 and 1973, the share of the non-Nordic EFTA members in total Nordic imports of high-tech products declined from 20.34% to 17.36% (a relative change of -14.6%). This points clearly to the importance of proximity for high-tech trade. Although differences in transport costs between Nordic and non-Nordic EFTA countries also exist, it is unlikely that these can explain more than a small fraction of the observed difference in market shares.

The enlargement of the EC and the free-trade agreements (1973-1987)

The enlargement of the EC in 1972, and the free-trade agreements that were negotiated between the EC and the remaining EFTA countries, led to the creation of a *de facto* European free-trade area in manufactures. Following the theories in this field, this free trade area should be expected to boost trade between the former EC and the former EFTA countries. Shares of the former EFTA countries, including the Nordic ones, in EC imports should be expected to increase. The same holds for the share of the former EC countries in Nordic imports.

By closer inspection it becomes clear that these expectations were only partly met. In the case of the (enlarged) EC, intra-regional trade as a share of total imports decreased for most manufacturing products, including high-tech goods. At the aggregate level, EC trade kept up better, as a result of increased EC trade in products based on natural resources (incl. oil and gas). As should be expected, the share of the EC countries in total Nordic imports increased, while the shares of the EFTA countries, including the Nordic ones, declined. But, unexpectedly, for high-tech goods the share of the EC in Nordic imports declined markedly.

The apparent failure of European integration to spur trade in manufacturing during this period deserves a comment. At a descriptive level, it is clear what happened. An increasing share of the European market was served by suppliers from Japan, the NICs and other non-European countries. This is what Jacquemin and Sapir (1988) have labelled "world integration". Although reduced external tariffs (through the Kennedy and Tokyo rounds) probably contributed to this, the main factor appears to be the process of industrialization, through a "catching up" in technology (Fagerberg, 1987) and the exploitation of cost advantages, in countries outside the EC and EFTA area. Thus, the "ceteris paribus" assumption clearly did not apply in this case.²³

²³ This, of course, is a supply effect of the kind that has to be taken into account in analysing integration effects, cf., Ferreira (1993).

7. Concluding remarks

This paper has discussed the possible impact of economic integration in Europe on trade in high-tech goods. Two findings should be noted:

1. A positive impact on trade in high-tech goods may be found for the Nordic countries in 1960s and early 1970s. There are some signs of a similar effect, although weaker, after 1972 in the trade between the Nordic countries and the EC. However, there is no evidence of a similar relationship for the EC. This supports the view that countries with small differences in culture and language are more likely than others to experience the positive impacts of integration on trade and production in high-tech goods.
- 2) Formal integration experiments are not the only, or even the main, factor behind the changes in the country composition of EC and Nordic imports in the last decades. Changes in the international division of labour caused by industrialization in low-income countries ("Catching up") are equally, or more important.

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Table 1 List of products

SITC.Rev.1

101 PRODUCTS BASED ON NATURAL RESOURCES

1	Animals, meat and meat preparations	00,01,091.3,411.3
2	Dairy products and eggs	02
3	Fish and fish preparations	03,411.1
4	Cereals and cereal preparations	04
5	Feeding-stuff for animals	08
6	Skins and leather manufactures	21,61
7	Wood and wood manufactures	24,63
8	Pulp and paper	25,64
9	Textiles	26,65
10	Iron ore	281
11	Iron, steel and ferro alloys	67
12	Aluminum	684
13	Other products based on natural resources	Rest 0-4 and 6, less 33,34,69

102 OIL AND GAS

14	Oil and gas	33,34
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103 CHEMICALS

15	Organic chemicals	512
16*	Inorganic chemicals	513,514
17	Dyestuffs, colouring materials	53
18*	Pharmaceuticals	54
19	Fertilizers	56
20*	Plastics	581.1 and 2
21	Other chemicals	Rest 5

104 MACHINERY AND TRANSPORT EQUIPMENT

22*	Power-generating machinery	711
23	Machinery for special industries or processes	712,715,717,718, 719.3,5and 8
24	Heating and cooling equipment	719.1
25	Pumps and centrifuges	719.2
26*	Typewriters and office machines	714.1 and 9
27*	Computers and peripherals	714.2 and 3
28*	Semiconductors	729.3
29*	Telecommunications	724.9
30*	Machinery for production and distribution of electricity	722,723,729.9
31*	Consumer electronics	724.1 and 2, 891.1
32	Domestic electrical equipment	725
33*	Scientific instruments, photographic supplies, watches/clocks	726,729.5 and 7, 861,862,864
34*	Cars (road motor vehicles)	732
35*	Aircrafts	734
36	Ships and boats (incl. oil rigs)	735
37	Other engineering products	Rest 7,less 719.4

105 TRADITIONAL INDUSTRIAL PRODUCTS

38	Manufactures of metal	69,719.4,812.1 and 3
39	Furniture	82

40	Clothing	84
41	Industrial products n.e.c.	Rest 8-9

* = High-tech

TABLE 2 ALL PRODUCTS: INTRA-NORDIC TRADE AS A SHARE OF TOTAL NORDIC IMPORTS 1961-1973

	1961	1965	1969	1973	Change 73-61
Products based on natural resources	15.6	19.2	24.2	25.6	10.0
Oil and gas	3.0	5.4	6.6	7.2	4.2
Chemical products	15.6	17.8	19.2	20.8	5.1
Machinery and transport equipment	17.3	20.1	20.0	21.4	4.1
Traditional industrial products	18.8	25.4	31.0	36.3	17.5
All products	15.2	18.8	21.5	23.0	7.8

TABLE 3 HIGH-TECH:INTRA-NORDIC TRADE AS A SHARE OF TOTAL NORDIC IMPORTS 1961-1973

	1961	1965	1969	1973	Change 73-61
Inorganic chemicals	7.4	10.3	11.3	11.7	4.4
Pharmaceuticals	13.3	15.7	18.2	20.3	7.0
Plastics	11.3	17.8	21.3	25.3	14.0
Power generating machinery	19.7	17.3	18.7	16.7	-3.0
Office machinery(*)	6.7	6.9	6.6	9.3	2.6
Computers	11.7	16.9	7.8	7.2	-4.5
Semiconductors	0.9	1.8	3.7	1.8	1.0
Telecommunication equipment	15.1	20.0	26.6	38.6	23.6
Machinery for production and distribution of electricity	16.4	20.0	22.7	23.7	7.2
Consumer electronics(*)	8.8	26.2	25.0	27.5	18.7
Instruments	5.5	6.6	7.2	8.0	2.5
Cars(*)	10.5	11.0	16.2	19.4	8.9
Aircraft	2.7	2.5	0.6	13.4	10.6
High-tech (broadly defined)	11.1	13.0	15.4	18.6	7.3
High-tech (narrowly defined)	11.6	13.8	14.9	17.9	6.2

(*) not included in the narrow definition

TABLE 4 ALL PRODUCTS: SHARE OF NORDIC COUNTRIES IN TOTAL EC IMPORTS (EC 6)
1961-1973

	1961	1965	1969	1973	Change 73-61
Products based on natural resources	8.2	7.6	6.7	6.0	-2.2
Oil and gas	0.0	0.1	0.1	0.2	0.2
Chemical products	2.2	2.2	2.1	1.6	-0.6
Machinery and transport equipment	4.8	4.1	3.8	3.8	-1.0
Traditional industrial products	4.1	3.3	2.7	2.8	-1.3
All products	6.3	5.5	4.7	4.2	-2.1

TABLE 5 HIGH-TECH: SHARE OF NORDIC COUNTRIES IN TOTAL EC IMPORTS (EC 6)
1961-1973

	1961	1965	1969	1973	Change 73-61
Inorganic chemicals	2.6	2.5	2.7	1.6	-1.0
Pharmaceuticals	3.1	3.0	2.1	2.6	-0.5
Plastics	2.8	1.9	1.1	1.1	-1.7
Power generating machinery	6.1	4.4	4.5	4.9	-1.2
Office machinery(*)	3.0	2.6	4.0	3.1	0.1
Computers	12.5	9.6	7.7	4.3	-8.2
Semiconductors	0.1	0.4	0.2	0.2	0.1
Telecommunication equipment	5.7	4.3	6.5	6.6	0.9
Machinery for production and distribution of electricity	4.0	4.1	3.6	3.2	-0.8
Consumer electronics(*)	0.2	1.2	1.0	1.5	1.3
Instruments	2.8	2.5	2.5	2.8	0.0
Cars(*)	1.9	1.8	1.7	2.1	0.2
Aircraft	1.3	1.2	1.2	0.5	-0.8
High-tech products(broadly defined)	3.3	2.7	2.6	2.5	-0.8
High-tech (narrowly defined)	4.3	3.4	3.0	2.8	-1.5

(*) not included in the narrow definition

TABLE 6 ALL PRODUCTS: SHARE OF INTRA-EC TRADE IN TOTAL EC IMPORTS (EC 6)
1961-1973

	1961	1965	1969	1973	Change 73-61
Products based on natural resources	31.4	35.6	42.1	45.5	14.1
Oil and gas	8.3	8.4	12.4	13.6	5.3
Chemical products	48.1	54.5	61.5	67.1	19.0
Machinery and transport equipment	53.2	59.6	62.9	62.9	9.7
Traditional industrial products	63.2	64.5	68.4	64.9	1.7
All products	35.8	41.0	47.7	49.5	13.7

TABLE 7 HIGH-TECH: SHARE OF INTRA-EC TRADE IN TOTAL EC IMPORTS (EC 6) 1961-1973

	1961	1965	1969	1973	Change 73-61
Inorganic chemicals	51.7	58.2	63.3	68.5	16.8
Pharmaceuticals	39.9	41.1	49.6	51.1	11.3
Plastics	53.2	68.1	76.6	83.0	29.9
Power generating machinery	35.3	43.3	49.0	48.0	12.6
Office machinery(*)	47.6	54.8	44.4	51.0	3.5
Computers	48.1	47.9	47.1	38.9	-9.1
Semiconductors	56.6	58.0	53.7	55.8	-0.8
Telecommunication equipment	63.4	68.4	56.5	62.4	-1.0
Machinery for production and distribution of electricity	59.3	60.6	62.0	61.9	2.5
Consumer electronics(*)	72.5	73.1	72.8	56.3	-16.2
Instruments	41.1	43.1	47.0	47.2	6.2
Cars(*)	76.2	80.6	86.8	83.9	7.7
Aircraft	24.9	28.5	27.5	14.1	-10.8
High-tech products(broadly defined)	58.8	65.1	69.3	69.3	10.4
High-tech (narrowly defined)	53.4	60.3	63.6	59.8	6.4

(*) not included in the narrow definition

TABLE 8 ALL PRODUCTS: INTRA-NORDIC TRADE AS A SHARE OF TOTAL NORDIC IMPORTS 1973-1987

	1973	1979	1984	1987	Change 87-73
Products based on natural resources	25.6	26.1	25.3	27.0	1.4
Oil and gas	7.2	9.3	21.6	26.2	19.0
Chemical products	20.8	19.7	19.6	20.5	-0.3
Machinery and transport equipment	21.4	20.1	17.3	16.5	-4.9
Traditional industrial products	36.3	31.7	28.2	25.7	-10.6
All products	23.0	21.1	21.8	22.0	-1.1

TABLE 9 HIGH-TECH:INTRA-NORDIC TRADE AS A SHARE OF TOTAL NORDIC IMPORTS 1973-1987

	1973	1979	1984	1987	Change 87-73
Inorganic chemicals	11.7	10.1	9.9	12.4	0.7
Pharmaceuticals	20.3	21.7	21.2	23.8	3.5
Plastics	25.3	26.4	25.9	24.9	-0.4
Power generating machinery	16.7	20.2	18.2	15.4	-1.2
Office machinery(*)	9.3	9.9	8.0	8.5	-0.8
Computers	7.2	7.8	8.6	7.6	0.4
Semiconductors	1.8	2.1	1.8	2.6	0.8
Telecommunication equipment	38.6	31.8	28.5	28.5	-10.1
Machinery for production and distribution of electricity	23.7	23.3	19.5	18.9	-4.8
Consumer electronics(*)	27.5	18.4	7.9	9.7	-17.8
Instruments	8.0	7.9	8.1	9.0	1.0
Cars(*)	19.4	16.9	16.4	15.4	-4.0
Aircraft	13.4	2.4	1.8	3.2	-10.2
High-tech(narrowly defined)	17.8	17.1	14.8	15.2	-2.6

(*) not included in the narrow definition

TABLE 10 CHANGES IN THE COUNTRY COMPOSITION OF NORDIC IMPORTS, 1987-1973

	Natural Resources	Oil & Gas	Chem- cals	Machin- ery	Tradition- al Ind.Pr.	All Prod.	High Tech(*)
(1) EC9	5.4	-6.0	4.1	-3.9	4.4	1.8	-5.1
of which							
EC6	7.6	-11.5	6.5	-0.1	8.6	4.2	-1.6
EC3	-2.2	5.5	-2.4	-3.8	-4.2	-2.3	-3.5
(2) EFTA6	0.3	17.6	-1.2	-5.2	-11.2	-1.8	-4.5
of which							
NORDIC	1.3	19.0	-0.3	-4.9	-10.6	-1.1	-2.6
of which							
SWEDEN	0.7	4.8	0.0	-3.9	-4.5	-1.3	-2.8
NORWAY	-0.4	9.2	-1.4	-1.5	-2.6	-0.5	-0.6
FINLAND	0.7	3.7	1.0	1.0	-2.6	0.8	1.1
ICELAND	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0
DENMARK	0.3	1.4	0.1	-0.5	-0.9	0.1	-0.3
(3) SOUTH EUROPE	0.3	-0.3	0.3	0.1	3.2	0.6	0.5
EUROPE (1+2+3)	5.9	11.4	3.2	-9.0	-3.6	0.6	-9.1
(4) USA+CANADA	-3.3	-0.6	-1.9	1.7	0.7	-0.5	2.4
(5) JAPAN	-0.6	0.0	0.2	5.1	0.0	2.2	6.0
(6) NIC	-1.2	0.2	0.5	1.8	2.4	0.9	2.3
(7) ROW	-0.9	-11.0	-1.9	0.3	0.5	-3.2	-1.6
SUM 1-7	0	0	0	0	0	0	0

(*) Narrowly defined

TABLE 11 ALL PRODUCTS: SHARE OF NORDIC COUNTRIES IN TOTAL EC IMPORTS
1973-1987 (EC9)

	1973	1979	1984	1987	Change 87-73
Products based on natural resources	8.7	8.3	8.4	8.9	0.2
Oil and gas	0.5	4.3	8.5	10.7	10.2
Chemical products	3.3	3.5	4.1	4.0	0.7
Machinery and transport equipment	5.8	4.9	4.4	4.6	-1.2
Traditional industrial products	4.9	4.2	4.3	4.0	-0.9
All products	6.3	5.9	6.6	6.5	0.2

TABLE 12 HIGH-TECH: SHARE OF NORDIC COUNTRIES IN TOTAL EC IMPORTS 1973-1987
(EC 9)

	1973	1979	1984	1987	Change 87-73
Inorganic chemicals	4.7	4.8	5.4	5.5	0.8
Pharmaceuticals	3.5	6.1	6.8	7.3	3.8
Plastics	3.5	4.4	4.7	4.3	0.8
Power generating machinery	5.8	3.4	4.1	4.9	-0.9
Office machinery(*)	2.8	3.9	4.5	4.8	2.0
Computers	4.7	4.0	2.9	3.0	-1.6
Semiconductors	0.3	0.5	0.5	0.8	0.4
Telecommunication equipment	10.6	8.8	7.9	10.0	-0.5
Machinery for production and distribution of electricity	4.8	4.3	4.0	4.2	-0.6
Consumer electronics(*)	7.2	3.6	3.0	2.8	-4.5
Instruments	3.3	3.3	3.2	3.8	0.5
Cars(*)	4.4	4.6	4.5	4.2	-0.2
Aircraft	0.9	1.0	0.9	0.8	-0.1
High-tech(narrowly defined)	4.1	3.9	3.7	4.1	-0.0

(*) not included in the narrow definition

TABLE 13 ALL PRODUCTS: SHARE OF INTRA-EC TRADE IN TOTAL EC IMPORTS 1973-1987 (EC9)

	1973	1979	1984	1987	Change 87-73
Products based on natural resources	45.8	48.6	49.0	54.1	8.3
Oil and gas	15.9	21.6	26.7	27.1	11.2
Chemical products	70.5	69.7	69.3	70.7	0.2
Machinery and transport equipment	67.1	64.4	55.1	58.2	-8.9
Traditional industrial products	63.7	58.6	53.3	53.3	-10.4
All products	51.0	50.2	48.3	54.6	3.7

TABLE 14 HIGH TECH: SHARE OF INTRA-EC TRADE IN TOTAL EC IMPORTS (EC9) 1973-1987

	1973	1979	1984	1987	Change 87-73
Inorganic chemicals	63.5	61.9	58.3	62.1	-1.5
Pharmaceuticals	61.6	60.6	59.4	59.5	-2.1
Plastics	82.8	82.9	79.4	79.7	-3.1
Power generating machinery	59.3	61.6	45.8	48.4	-10.8
Office machinery(*)	60.0	61.7	37.6	49.2	-10.8
Computers	52.6	48.2	40.5	45.8	-6.8
Semiconductors	53.6	47.5	37.4	42.4	-11.2
Telecommunication equipment	63.6	52.5	42.8	40.7	-22.9
Machinery for production and distribution of electricity	64.7	60.8	51.7	54.2	-10.5
Consumer electronics(*)	46.7	37.9	28.2	34.3	-12.4
Instruments	55.8	50.9	45.3	48.6	-7.2
Cars(*)	84.8	77.8	70.3	71.6	-13.2
Aircraft	26.5	54.8	66.7	59.0	32.6
High-tech (narrowly defined)	60.2	59.3	51.6	53.9	-6.3

(*) not included in the narrow definition

TABLE 15 CHANGES IN THE COUNTRY COMPOSITION OF EC IMPORTS (EC 9), 1987-1973

	Natural Resources	Oil & Gas	Chem- icals	Machin- ery	Tradition- al Ind.Pr.	All Prod.	High Tech(*)
(1) EC9	8.3	11.2	0.1	-9.0	-10.4	3.7	-6.3
of which							
EC6	6.0	2.0	-3.0	-9.1	-11.0	1.2	-7.9
EC3	2.3	9.2	3.2	0.2	0.7	2.5	1.6
(2) EFTA6	2.3	10.1	1.2	-0.5	0.3	1.9	0.3
of which							
NORDIC	0.2	10.2	0.7	-1.2	-0.9	0.2	-0.0
of which							
SWEDEN	-0.5	0.9	0.3	-0.8	-0.8	-0.5	-0.3
NORWAY	-0.2	8.7	-0.1	-0.4	-0.2	0.5	-0.0
FINLAND	0.5	0.4	0.2	0.2	-0.0	0.1	0.2
ICELAND	0.1	0.0	-0.0	-0.0	0.0	0.0	-0.0
DENMARK	0.3	0.2	0.3	-0.2	0.1	0.0	0.0
(3) SOUTH EUROPE	1.8	1.1	0.7	2.0	3.3	1.6	0.9
EUROPE (1+2+3)	12.4	22.4	2.1	-7.4	-6.8	7.2	-5.0
(4) USA+CANADA	-3.8	0.2	-3.7	-2.5	-0.6	-2.2	-3.7
(5) JAPAN	-0.2	0.0	0.2	6.3	0.2	2.5	4.9
(6) NIC	-0.2	1.7	0.3	2.9	2.3	1.3	2.9
(7) ROW	-8.2	-24.2	1.1	0.7	4.8	-8.9	0.9
SUM 1-7	0	0	0	0	0	0	0

(*) Narrowly defined